

# Using GW Level Data to Estimate Change in Groundwater Storage

California Water Plan Update 2013  
Groundwater Caucus – April 2012  
Groundwater Content Enhancement - Deliverable #4 Update

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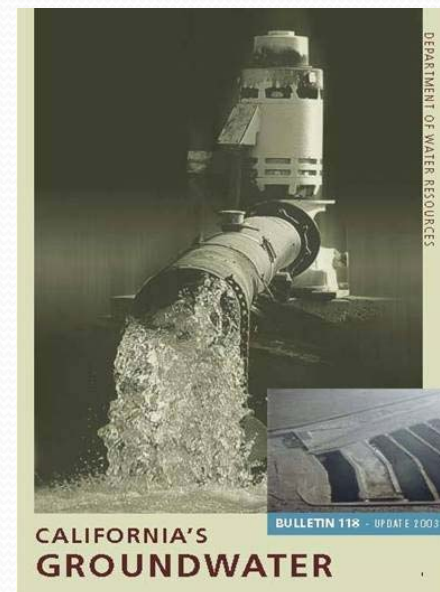
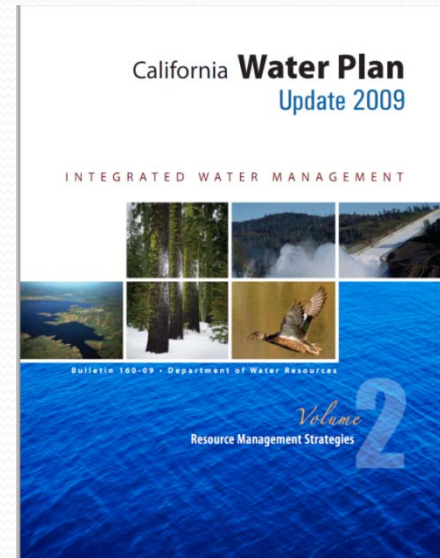


# Current Work

- Preparing GW change estimates for Central Valley
  - Iterative review of GW level data
- Reviewing reports and models to establish storage coefficient values
- Documentation of modeling assumptions and workflows

# Overview

- Enhanced GW information is needed for CWP Update 2013
  - Including change in GW storage estimates
- Deliverable 4 data processing and modeling goals
  - Transparent
  - Repeatable
  - A Statewide Process





# Overview

## Deliverable 4...

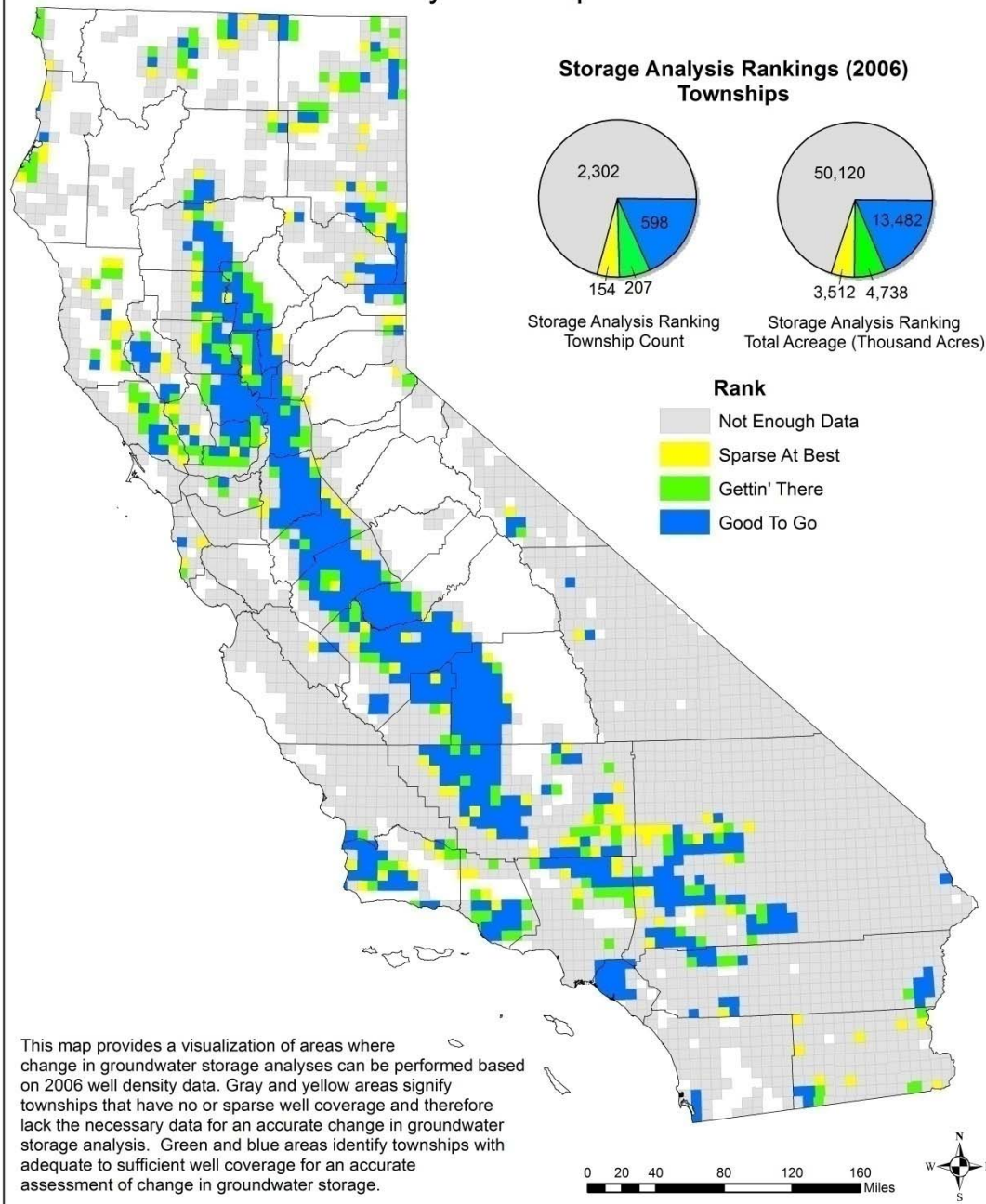
- Provides a method to estimate Spring to Spring changes in groundwater storage using groundwater level data
  - And it also estimates average change in GW elevation
- Does Not...
  - Replace/supersede other methods
  - Compile or report results from other efforts

# Data Availability

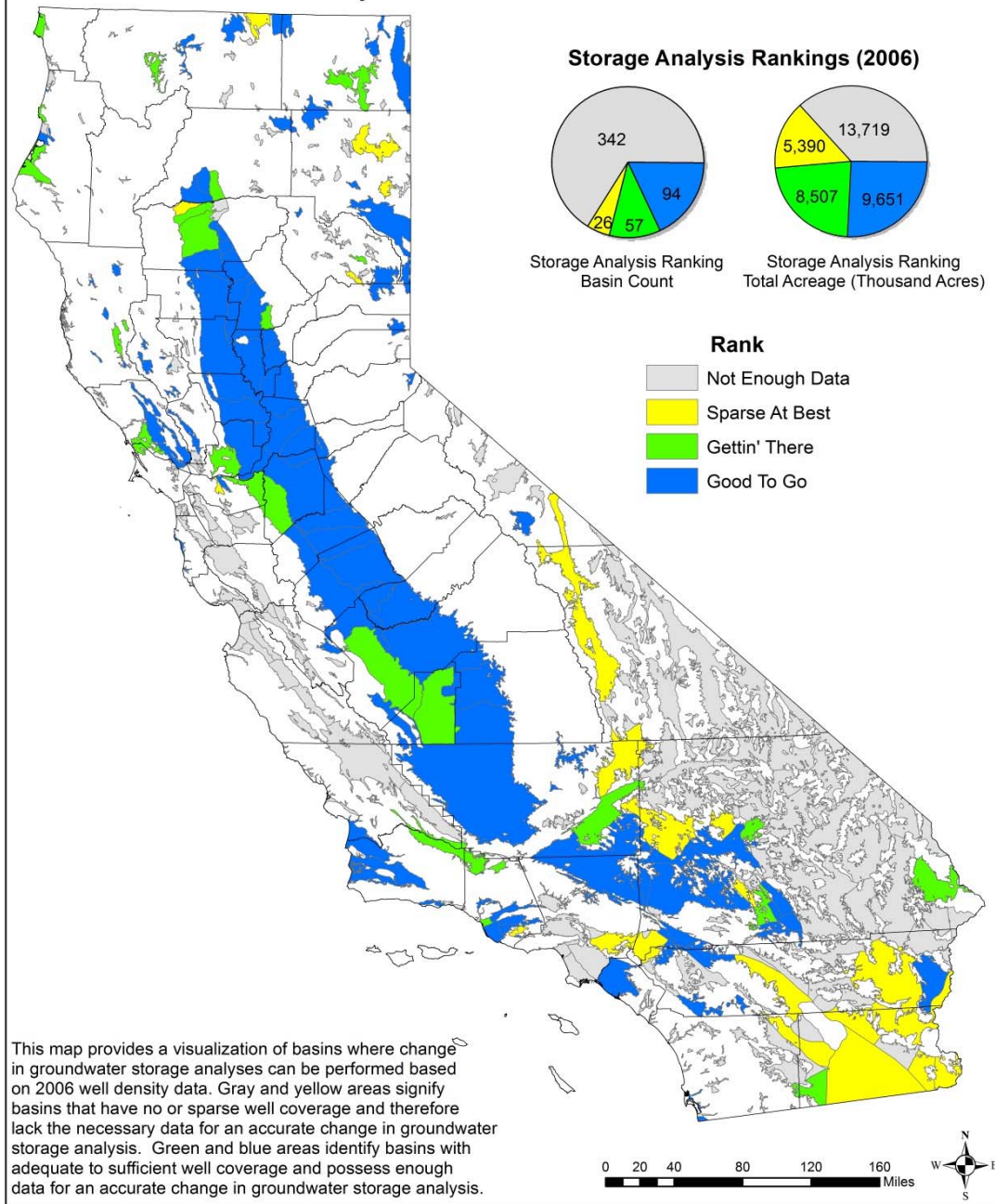
- Data is available for the Change in GW Storage Model if it is collected...
  - In the Spring season (or pre-irrigation)
  - From wells intersecting unconfined aquifers
- Data availability varies from year to year
- Only data existing in DWR database is used



# Assessment for Change in Groundwater Storage Analyses (2006) By Township



# Assessment for Change in Groundwater Storage Analyses (2006) By Groundwater Basin





# Reporting Areas

- The model extent is determined by the user
- Model extent includes “reporting areas” and “non-reporting areas”
  - Reporting Areas are areas with available data
  - Non-Reporting Areas do not have available data
- Change in GW Storage estimates are compiled/summarized by “reporting areas”

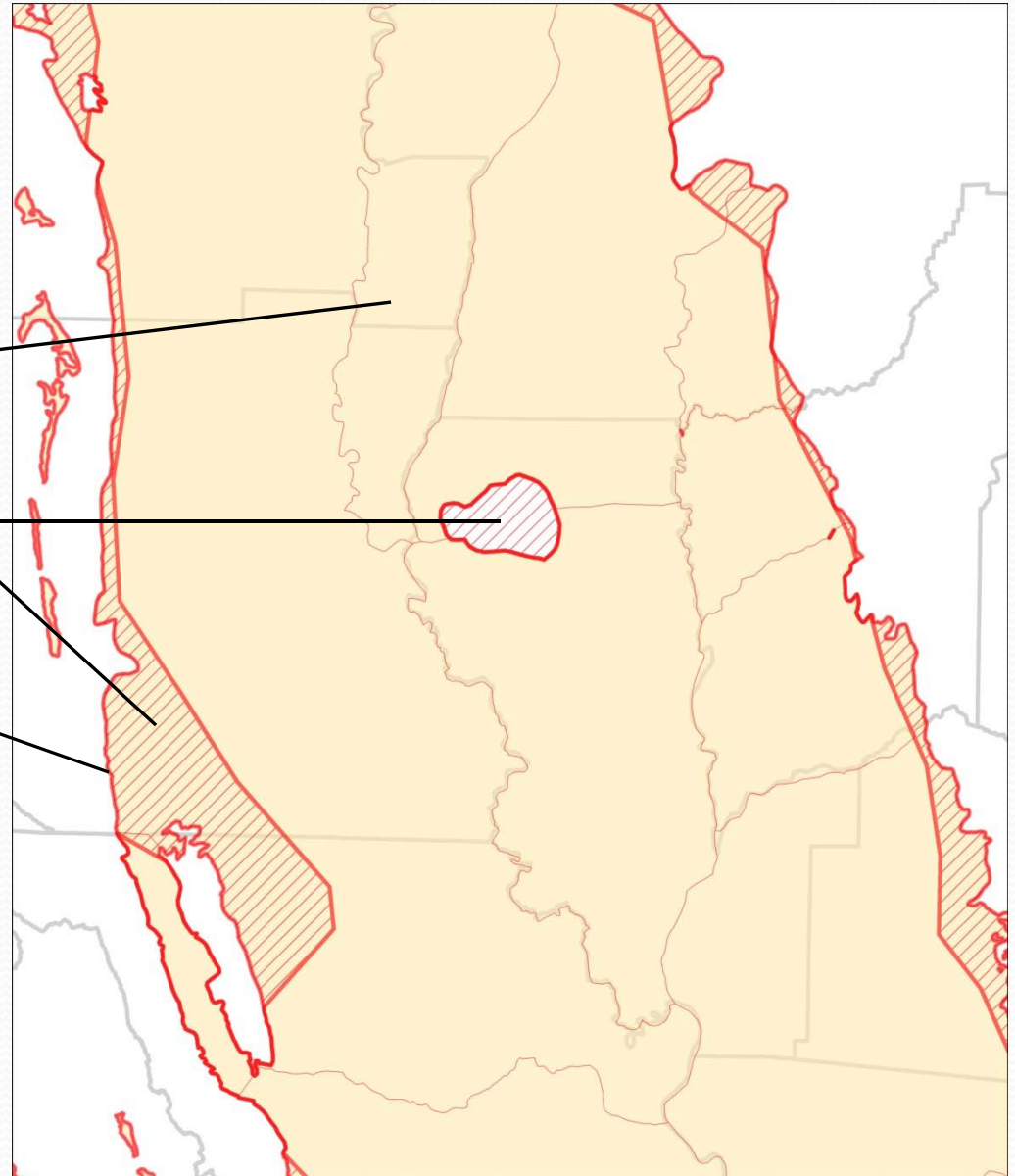


- Example of:

- Reporting Area(s)

- Non-Reporting Areas

- Model Extent



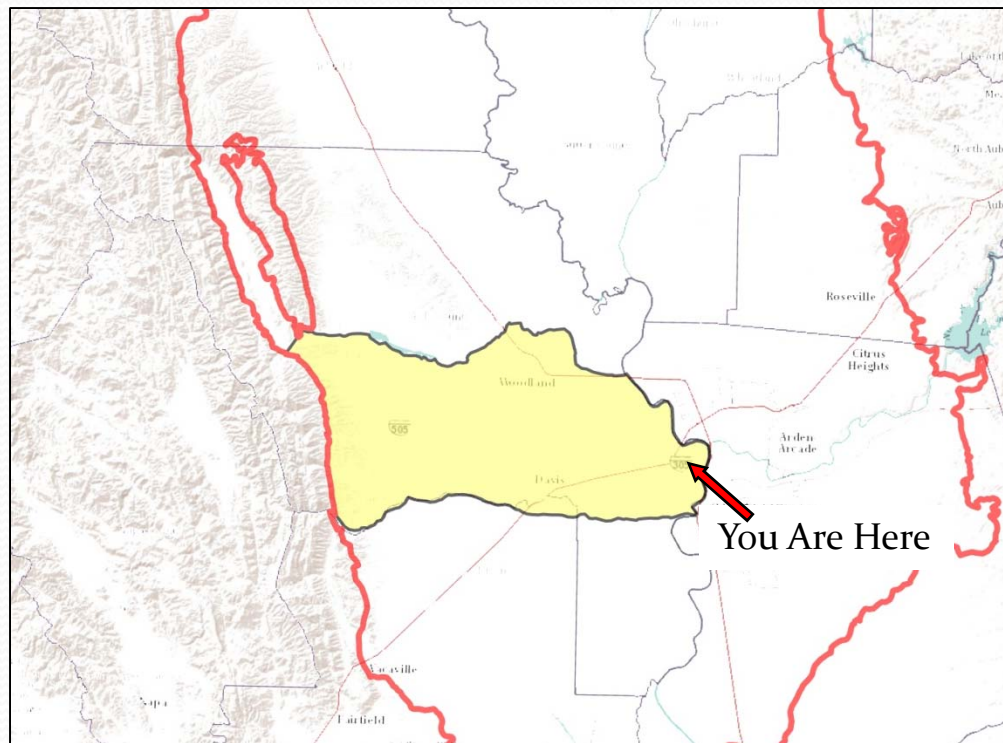
# Storage Coefficients

- Still in development...
- Variables representing unconfined conditions
- Obtained from sources that are widely available and accepted
  - Studies available for the Central Valley:
    - C2VSIM
    - CVHM (USGS Central Valley Hydrologic Model)
    - B118-6 Appendix A (USGS report “Groundwater Conditions in the Sacramento Valley, 1978)
    - Other...
- Developing tools to create a weighted average “on the fly”



# Model Process Walkthrough

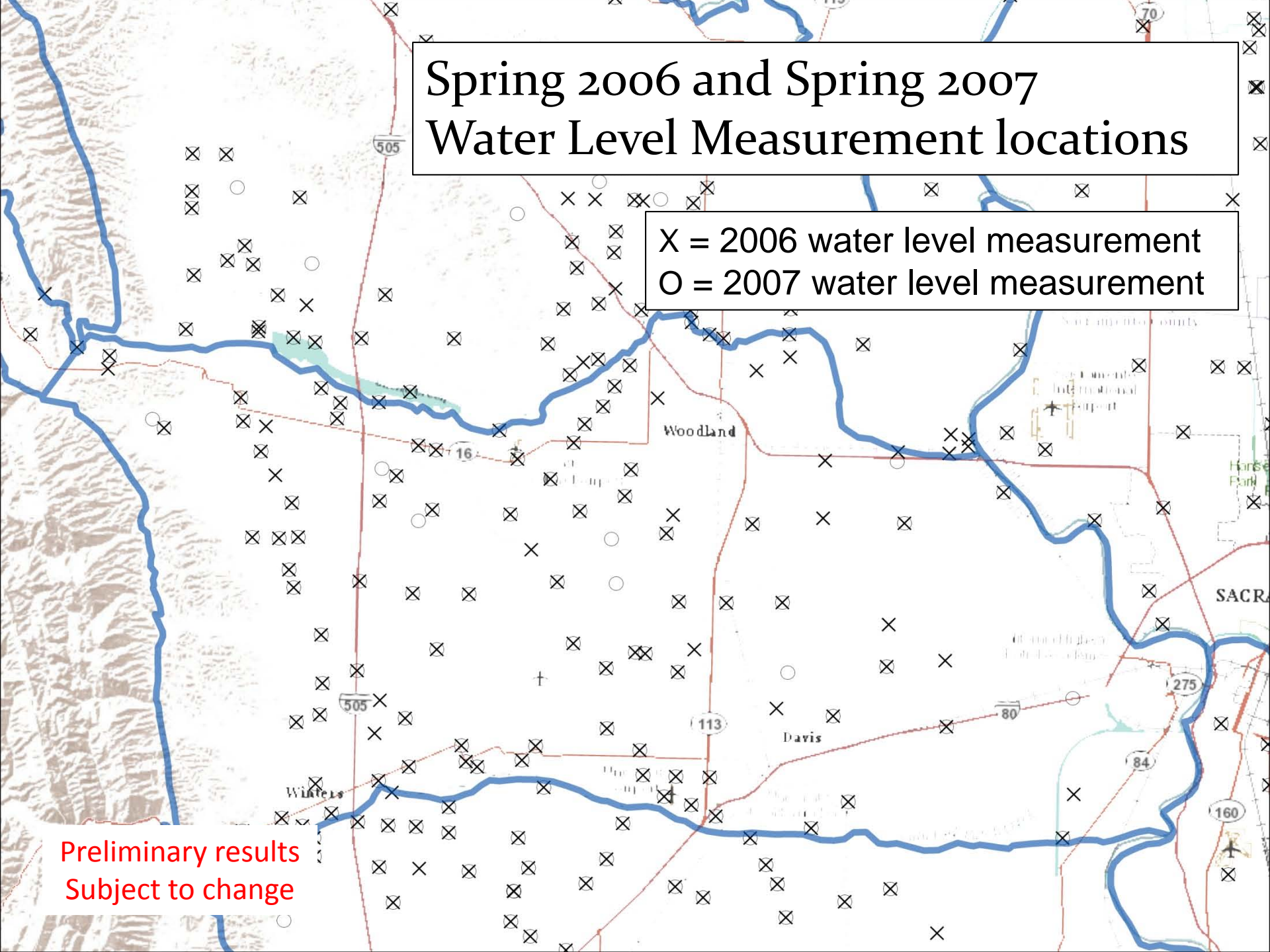
- DWR Bulletin 118 Groundwater Subbasin 5-21.67
  - Yolo Subbasin



# Spring 2006 and Spring 2007 Water Level Measurement locations

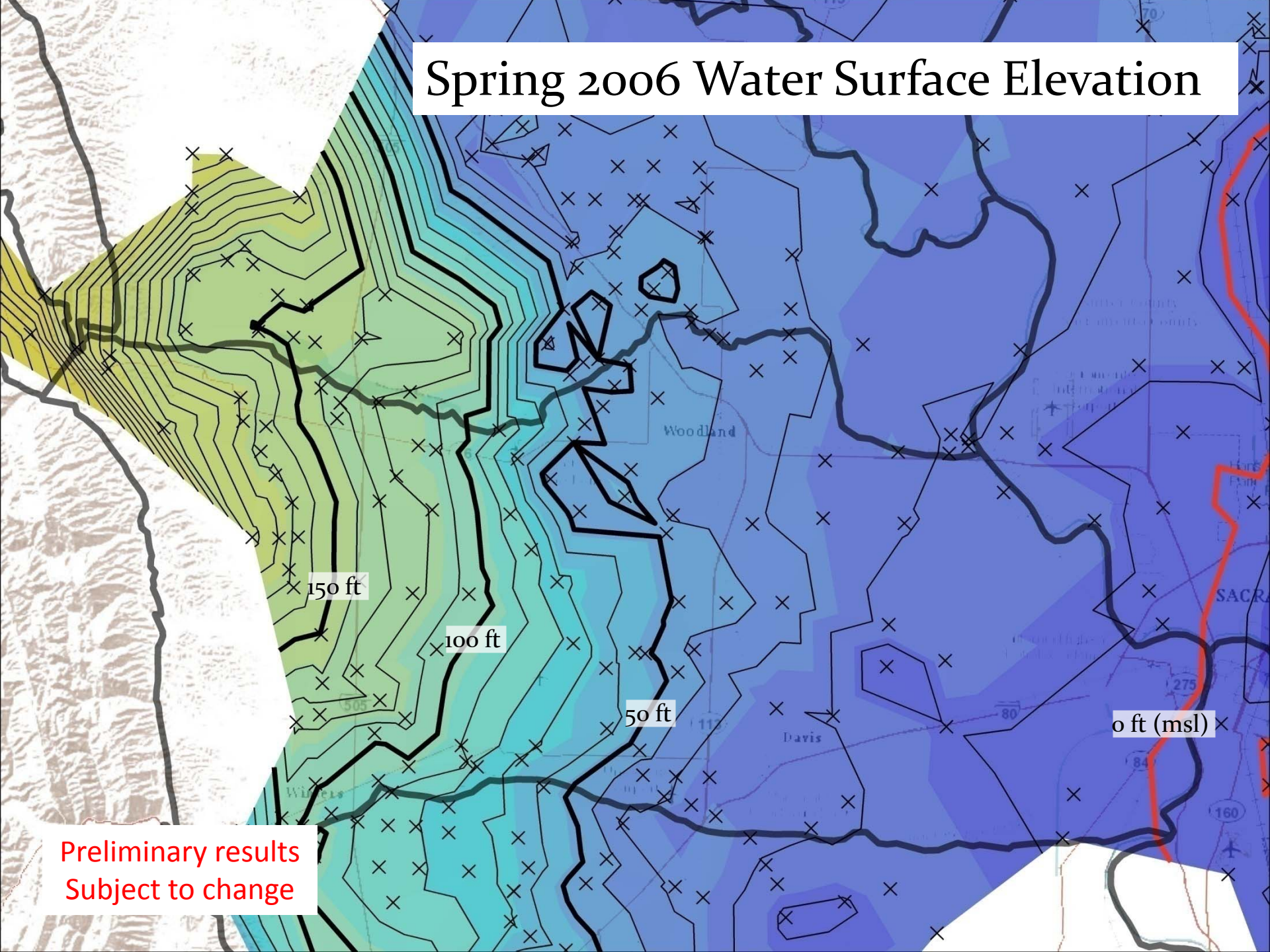
X = 2006 water level measurement  
O = 2007 water level measurement

Preliminary results  
Subject to change





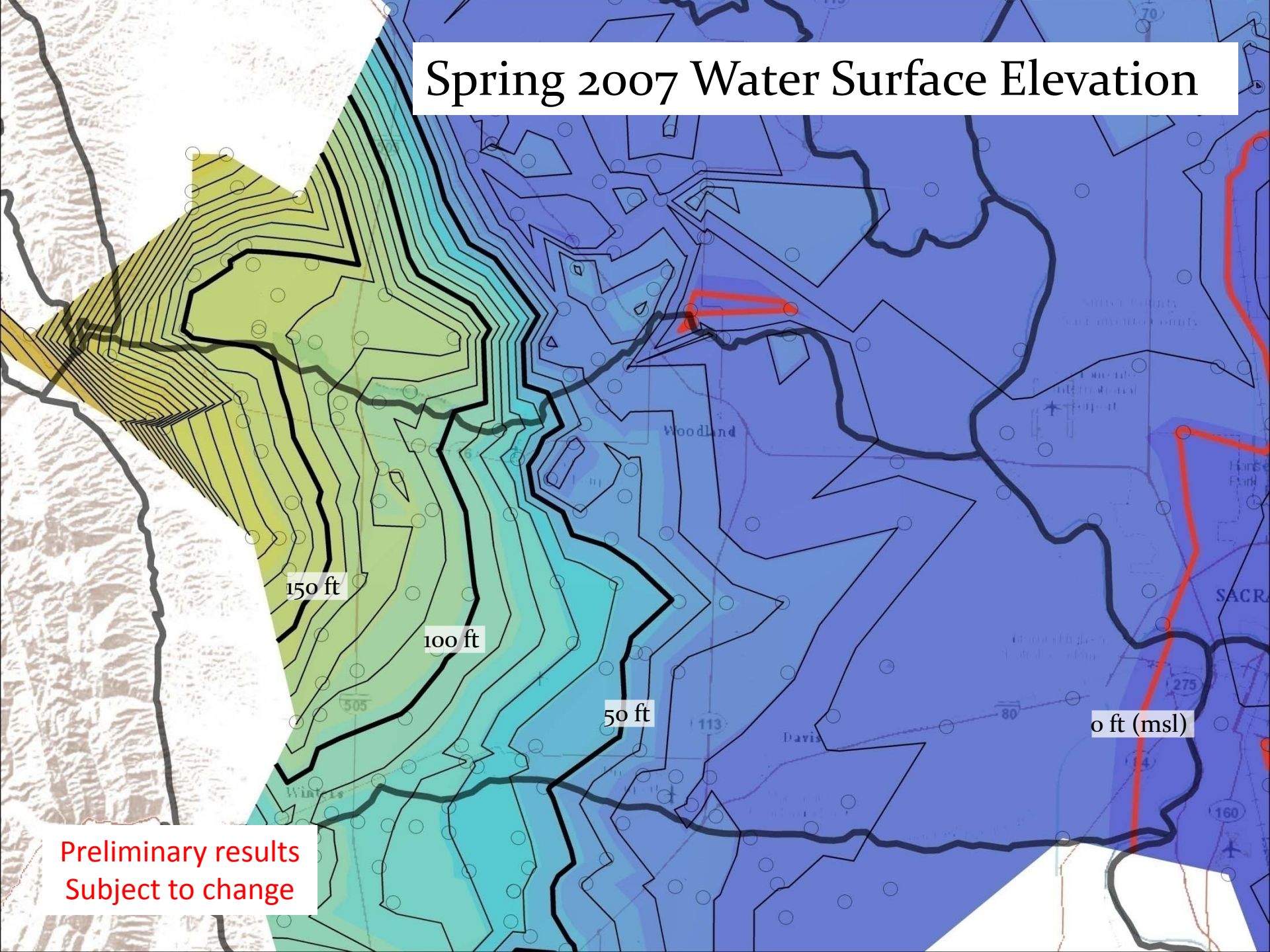
# Spring 2006 Water Surface Elevation



Preliminary results  
Subject to change



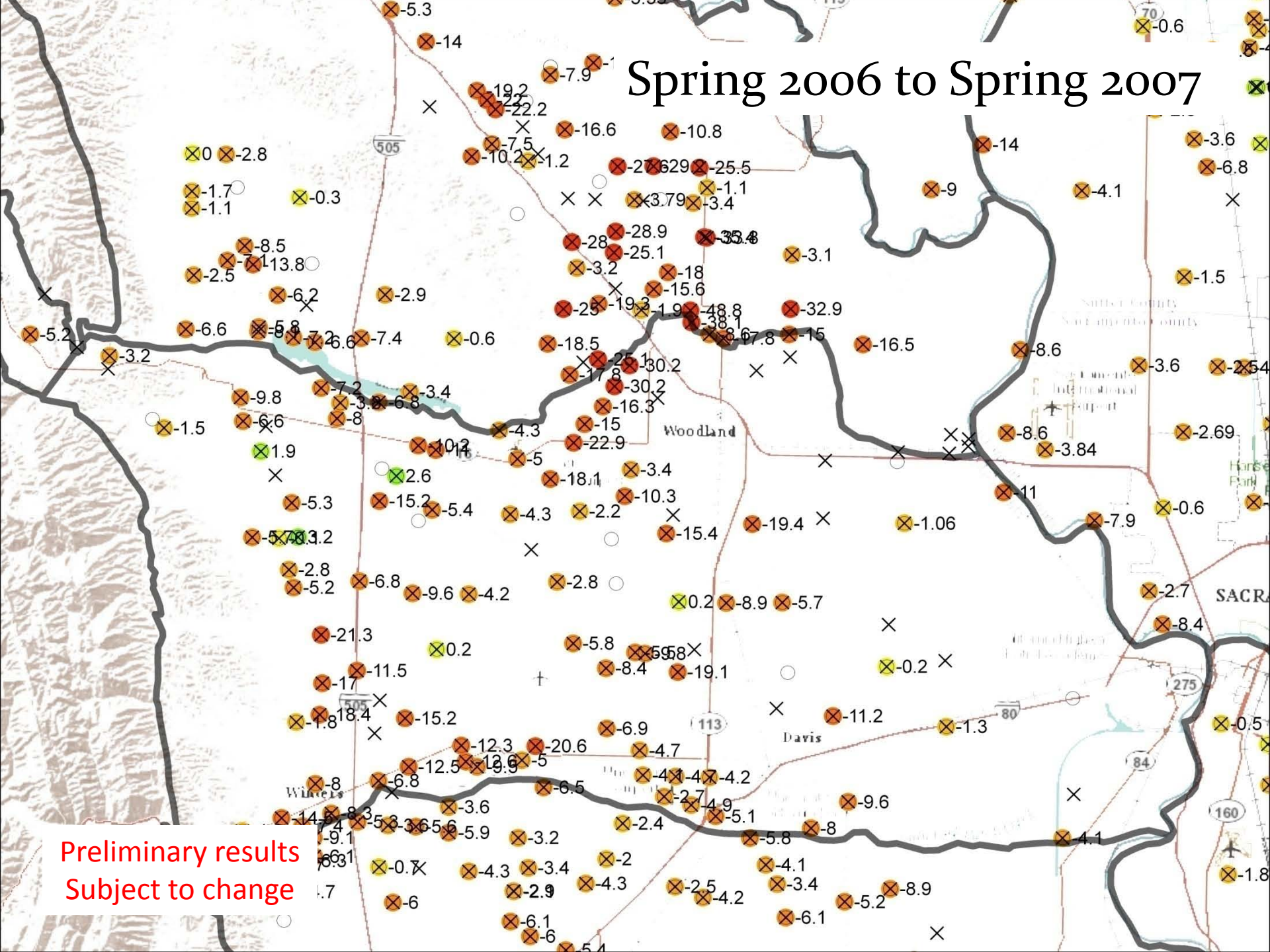
# Spring 2007 Water Surface Elevation



Preliminary results  
Subject to change



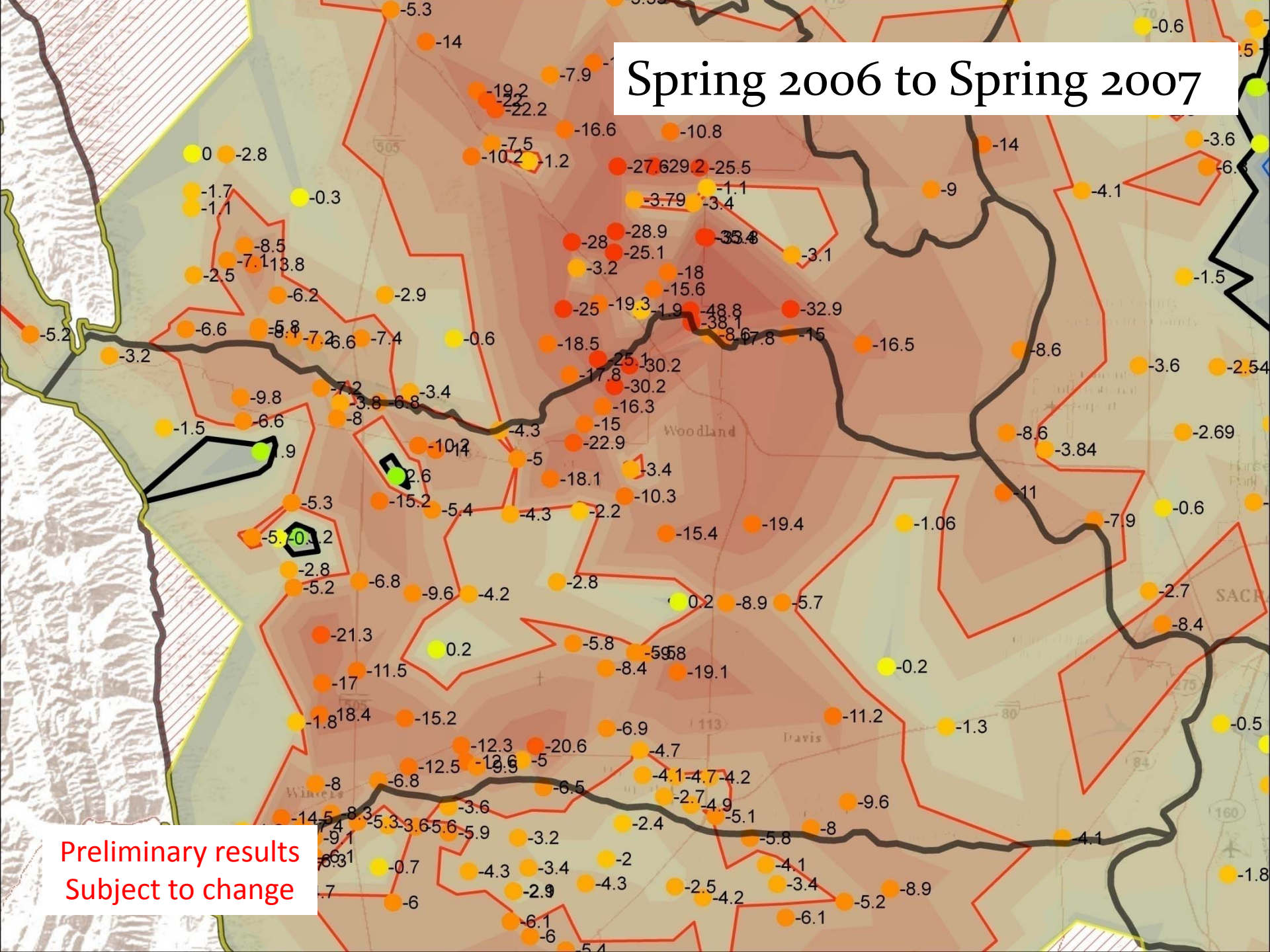
# Spring 2006 to Spring 2007



Preliminary results  
Subject to change



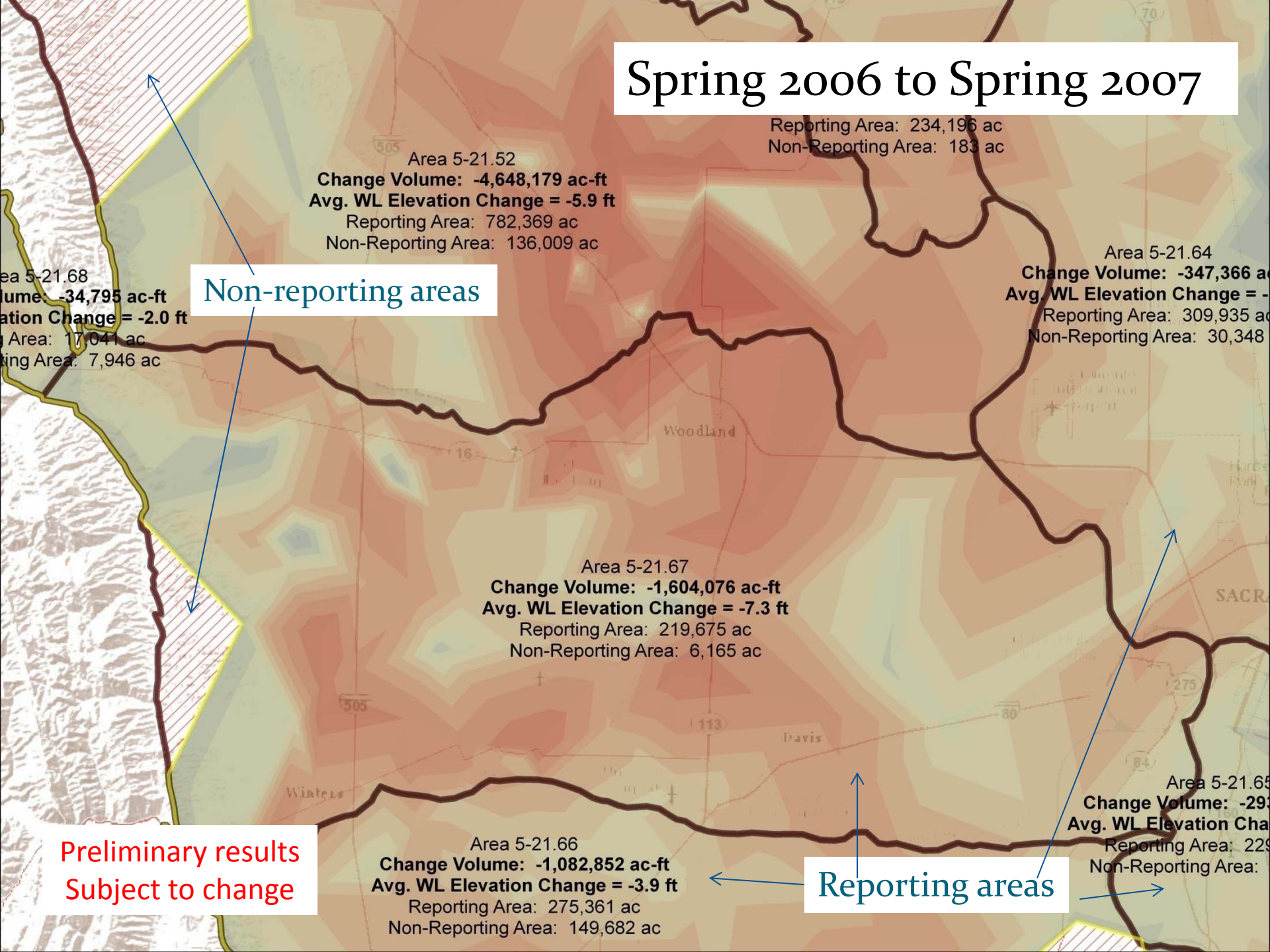
# Spring 2006 to Spring 2007



Preliminary results  
Subject to change



# Spring 2006 to Spring 2007

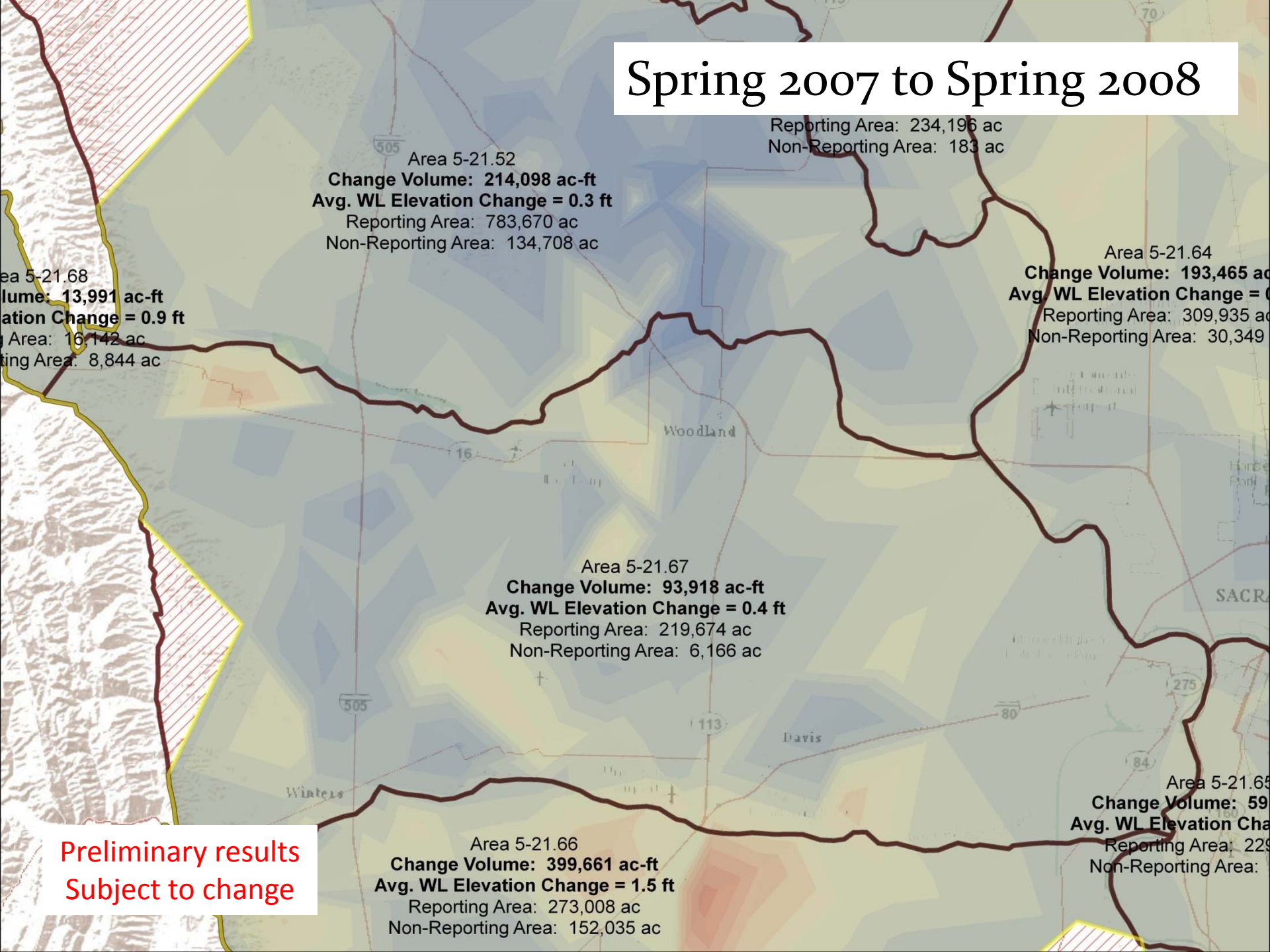


Non-reporting areas

Preliminary results  
Subject to change

Reporting areas

# Spring 2007 to Spring 2008



**Preliminary results**  
**Subject to change**



## Spring 2008 to Spring 2009

Area 5-21.52  
**Change Volume: -2,258,614 ac-ft**  
**Avg. WL Elevation Change = -2.9 ft**  
 Reporting Area: 783,671 ac  
 Non-Reporting Area: 134,708 ac

Reporting Area: 234,196 ac  
Non-Reporting Area: 183 ac

Volume: -7,399 ac-ft  
 Elevation Change = -0.5 ft  
 Storage Area: 14,224 ac  
 Impervious Area: 10,762 ac

Area 5-21.64  
Change Volume: -216,795 ac-ft  
Avg. WL Elevation Change = -0.01 ft  
Reporting Area: 309,935 ac  
Non-Reporting Area: 30,349 ac

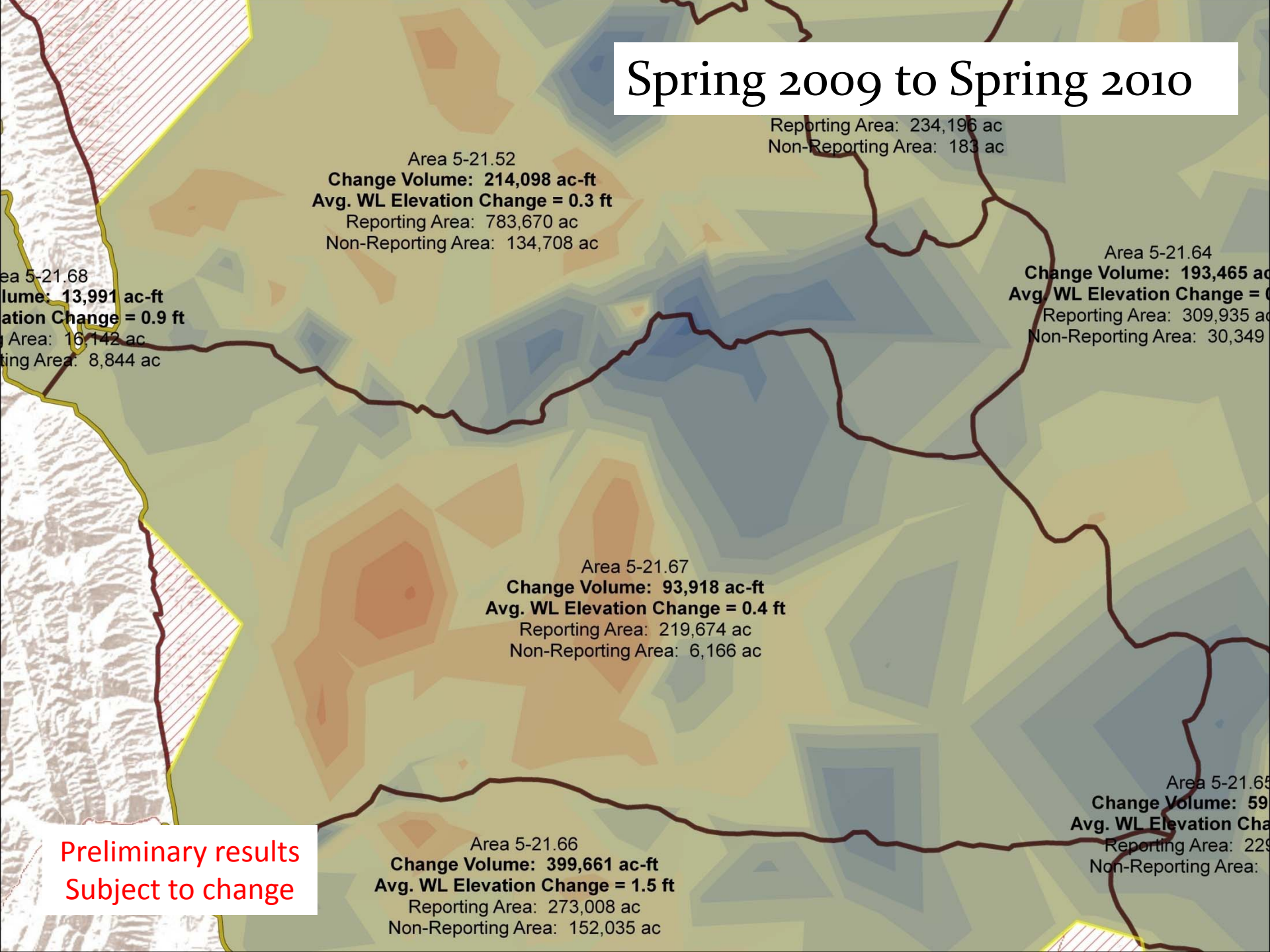
Area 5-21.67  
**Change Volume: -230,236 ac-ft**  
**Avg. WL Elevation Change = -1.0 ft**  
 Reporting Area: 219,675 ac  
 Non-Reporting Area: 6,165 ac

Area 5-21.66  
**Change Volume: -221,528 ac-ft**  
**Avg. WL Elevation Change = -0.8 ft**  
 Reporting Area: 268,482 ac  
 Non-Reporting Area: 156.561 ac

Area 5-21.65  
Change Volume: -16  
Avg. WL Elevation Cha  
Reporting Area: 228  
Non-Reporting Area:

Preliminary results  
Subject to change

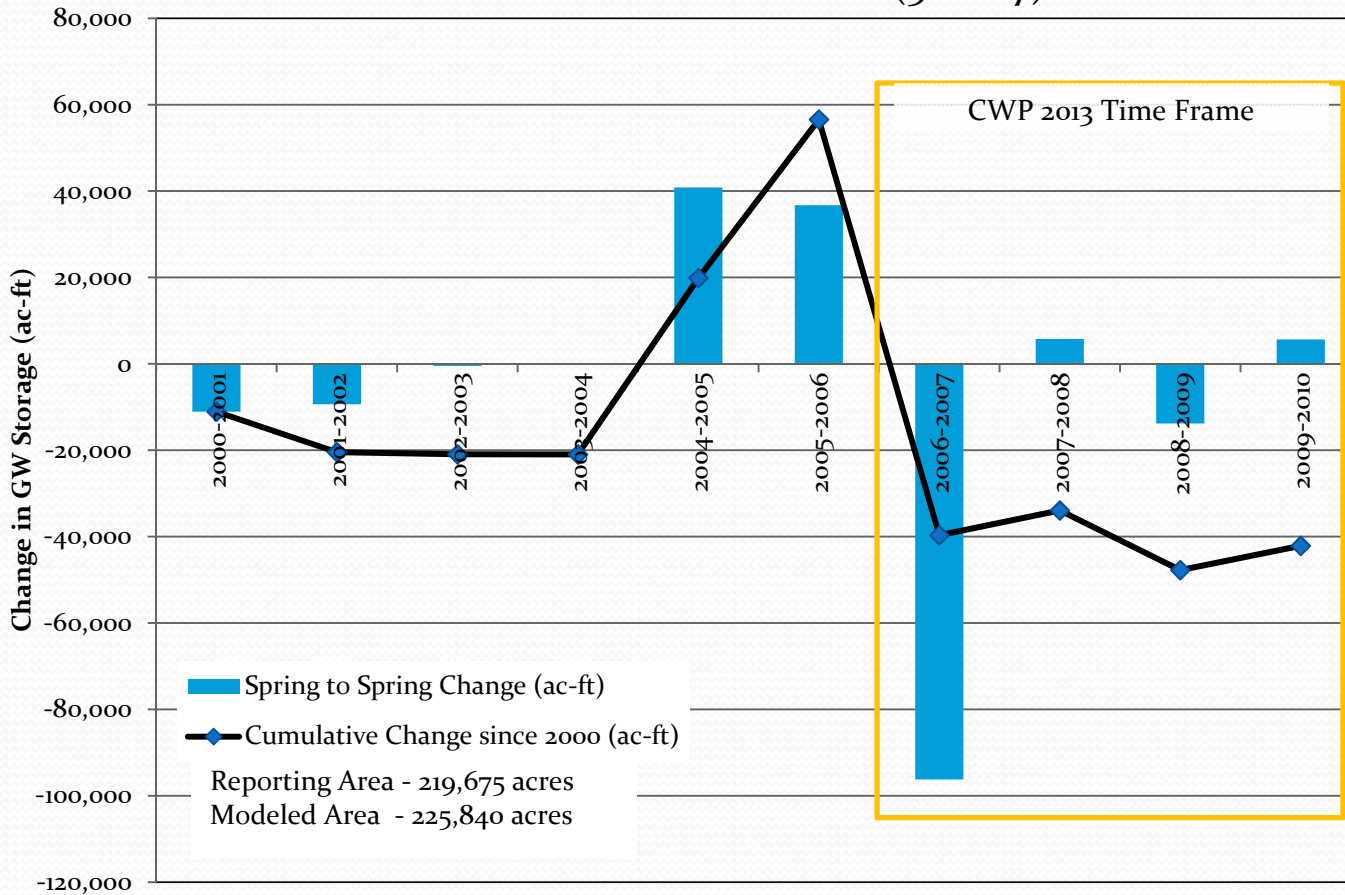
# Spring 2009 to Spring 2010



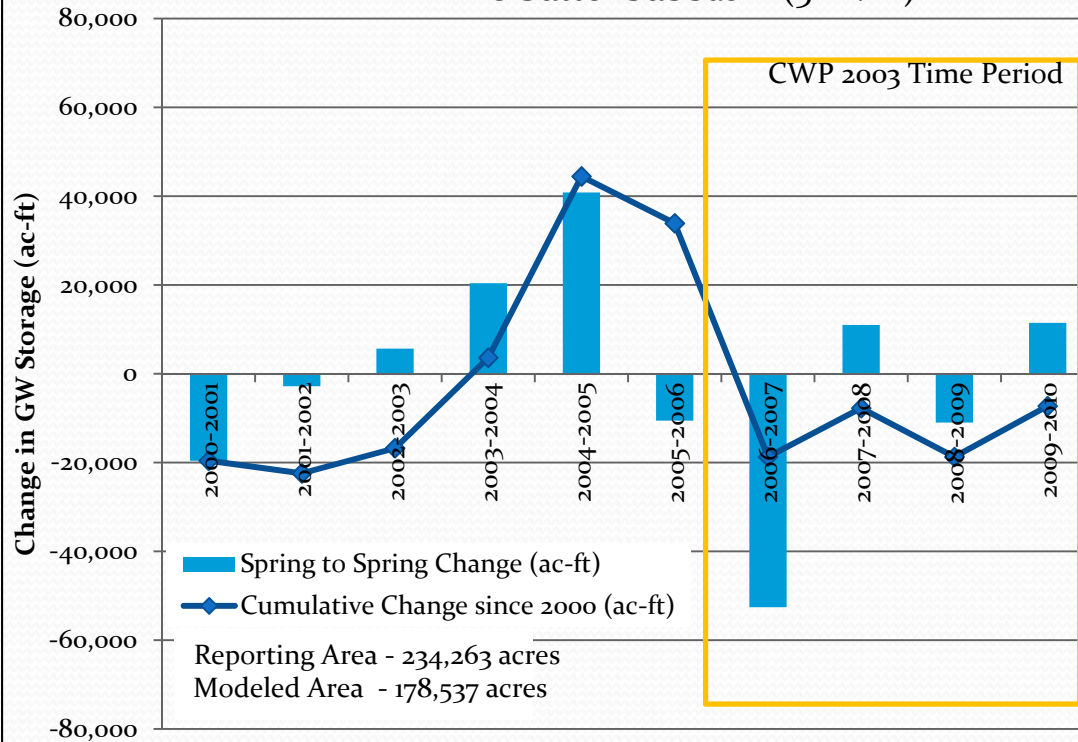


# Analysis Results Summary

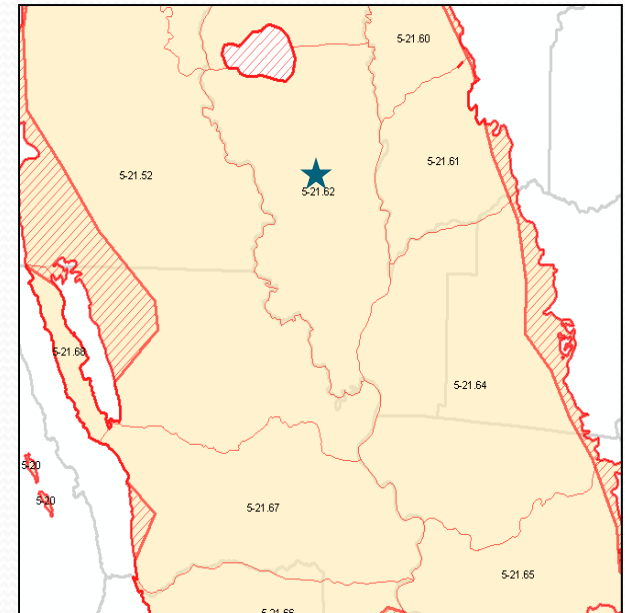
Estimated Change in Spring to Spring GW Storage  
B118 Yolo Subbasin (5-21.67)



## Estimated Change in Spring to Spring GW Storage\* B118 Sutter Subbasin (5-21.62)

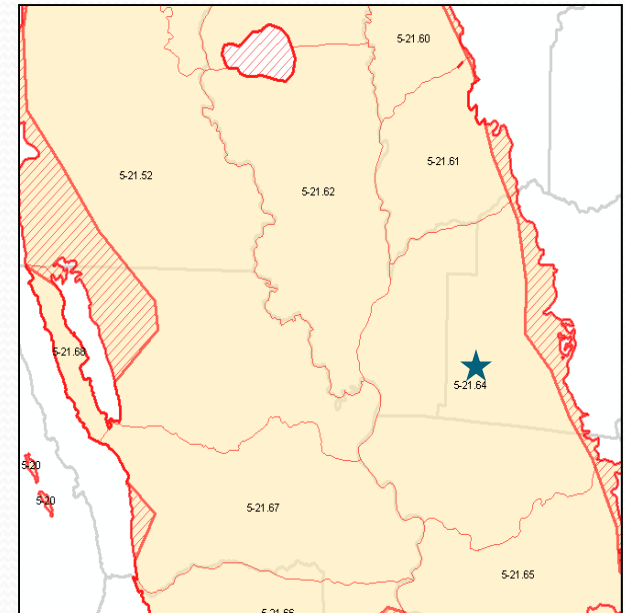
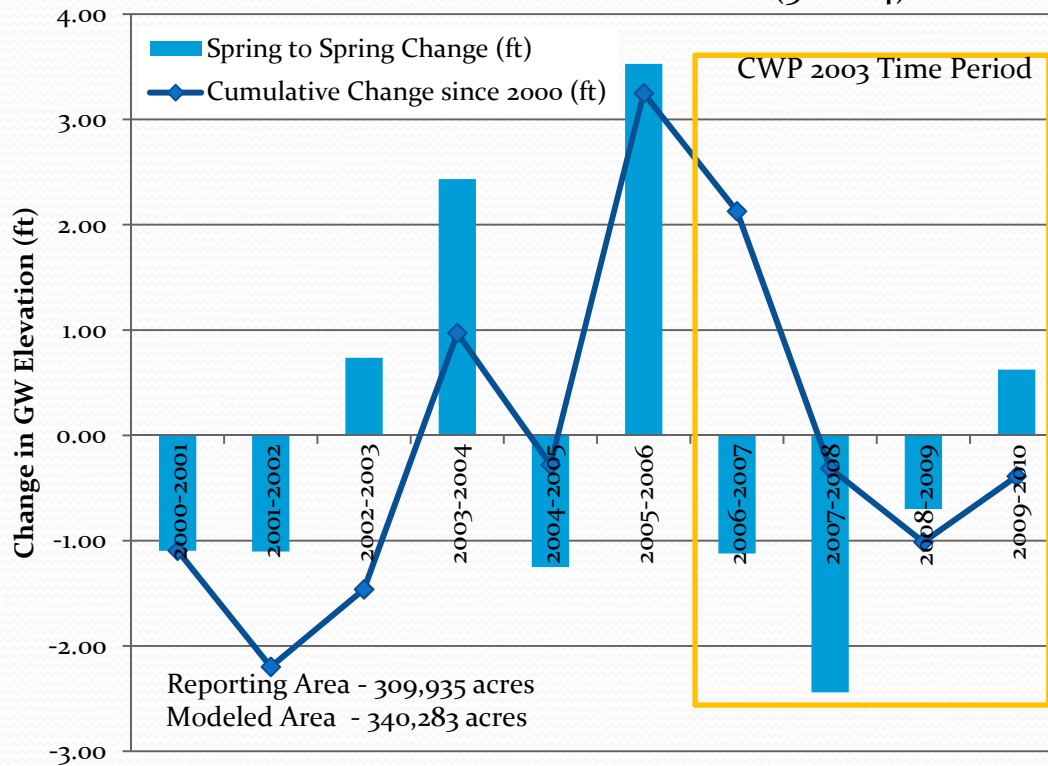


\*note: applied Storage Coefficient (SY) = 0.060





### Estimated Change in Average GW Elevation B118 North American Subbasin (5-21.64)



# Next Steps...

- Finish reviewing GWL data (2006 – 2010 statewide)
- Finish fine tuning geoprocessing tools
- Identify **reporting** and **non-reporting** areas
- Develop **storage coefficient** datasets
- Run calculations – Review results
  - 1<sup>st</sup> – Central Valley GW basins/subbasins (Bulletin 118)
  - 2<sup>nd</sup> – Statewide where possible
- Submit model description and preliminary results for review and comment





...Is there time for any questions/comments?